3.14 Air Quality

3.14.1 Scope of Analysis and Analysis Methods

3.14.1.1 Analysis Area

The Como Forest Health Project Area is in Montana/Idaho Airshed 4, which includes the Bitterroot National Forest and the western boundary of the Selway-Bitterroot Wilderness, and all of Ravalli County. The airshed boundary is identical to Ravalli County boundaries and is the analysis area of direct and indirect effects on air quality. The Montana/Idaho Airshed Group (Airshed Group), authorized by the Montana Department of Environmental Quality (MDEQ), defines and manages the airsheds. The Airshed Group implements the Smoke Management Program in Montana and Idaho using Best Available Control Technology (BACT). More information about this group and managing the competing needs of restoring fire to fire adapted ecosystems while maintaining clean air and protecting public health can be found at, http://www.smokemu.org. The 1.35 million acre Selway-Bitterroot Wilderness is a Class 1 Airshed located directly west of the Selway-Bitterroot Roadless area. Missoula and Butte, Montana are the closest impact zones and are non-attainment areas (Figure 3.14-1). Salmon, Idaho is the closest impact zone to the south of the project area (*Figure 3.14- 2*). Smoke from the proposed treatments would not affect the impact zones because it would disperse before reaching them. The impact zones are not included in the analysis area.

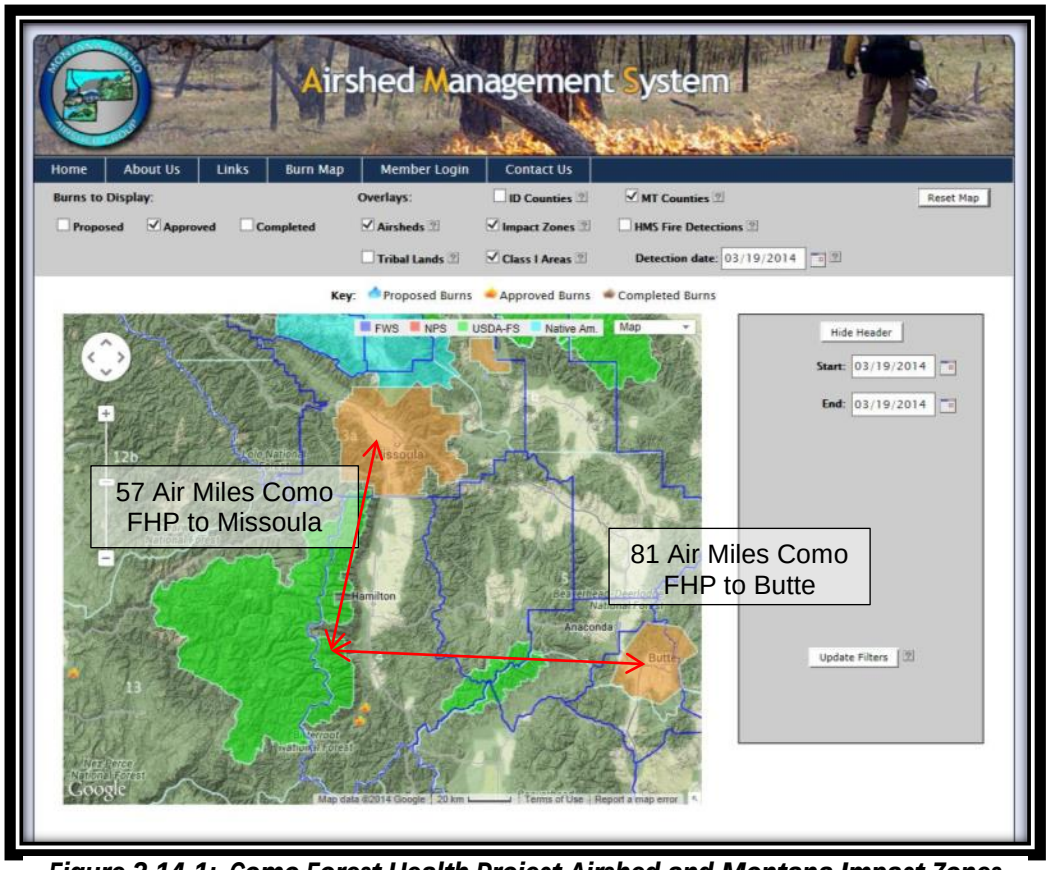

Figure 3.14-1: Como Forest Health Project Airshed and Montana Impact Zones

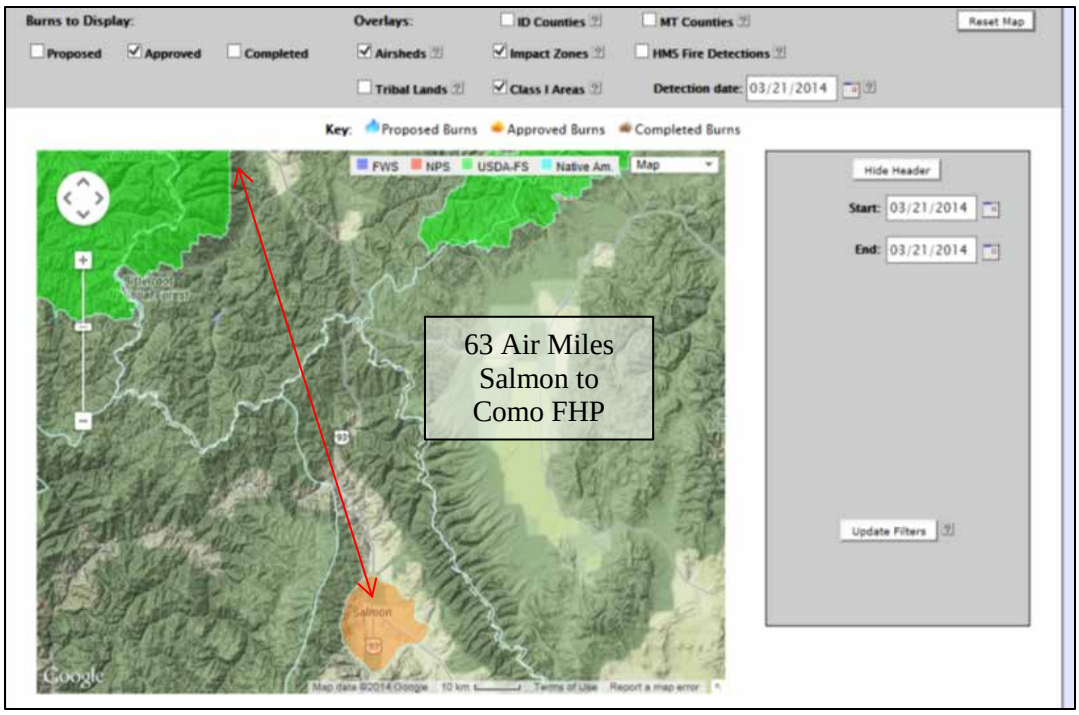

Figure 3.14- 2: Como Forest Health Project Airshed and Idaho Impact Zones

Air Quality

Air Quality associated with the Rock Creek and Lick Creek/Lost Horse areas are generally considered good to excellent most times of the year. Local adverse effects result from native-surfaced roads and wildfires. If management activities, which require prescribed burning of logging and natural fuels are initiated in the area, then air quality would also be affected.

The Aleutian Low and the Pacific High strongly influence local climates. This maritime air is borne eastward on prevailing westerly winds. The Aleutian Low dominates during the winter months, bringing periods of heavy precipitation in the form or snow or spring rains. The Pacific High dominates during the summer, resulting in hot and dry weather. Low intensity, long duration frontal storms occur commonly in the fall, winter, and spring. High intensity, short duration thunderstorms accompanied by locally high winds occur between May and October.

Smoke from wildfires and prescribed burns usually drift north eastward and eventually settle into the Western Montana valleys. Restrictions on prescribed burning on the Bitterroot National Forest have been imposed during fall burning season because of adverse effects on air quality in parts of western Montana. Locally, all major river canyons are subject to temperature inversions, which pool smoke in the drainage bottoms. Temperature inversions can occur at any time during the year, but they are most common in the fall.

On the Bitterroot National Forest, broadcast burning and under burning are generally done during the early to mid-spring, and late fall. Burning of logging and thinning slash which has been gathered into piles is often continued into late fall. The USFS does have the right to apply for winter burn conditions permit which is required if burning was to

continue from Dec 1 – March 1 (See Montana/Idaho Airshed Group pgs. 12, 13 & 19) on a case-by-case basis.

3.14.1.2 Air Quality Analysis Methods

The two main issues related to air quality are:

- Smoke emissions from understory and pile burning associated with the Como Forest Health Project may adversely affect residents in Darby and Lost Horse area(s).
- Smoke emissions from understory and pile burning associated with the Como Forest Health Project could temporarily (1 day – 2 weeks) affect the Selway-Bitterroot Wilderness Class 1 Airshed.

The analysis identifies treatment units and type of burn treatment for each unit. Total treatment area is calculated by alternative.

Potential air quality impacts from the Como Forest Health project were determined using the Smoke Impact Spreadsheet (SIS) model (Air Sciences, 2003) V11-30-2004. The SIS model uses an Excel spreadsheet to link to the First Order Fire Effects Model (FOFEM59) for broadcast burn and wildfire fuel emissions, the Consume 2.1 model for pile burn emissions, and the CalPUFF model for dispersion modeling. The model predicts ambient $PM_{2.5}$ concentrations from burning activities for up to 50 miles downwind of the burn (Dzomba and Story, 2005)

Measurement indicators are estimations for:

- 24-hour maximum downwind smoke emissions measured as fine particles, PM2.5 micrograms per cubic meter (ug/m3).
- Effect on the Class 1 Airshed as measured in upwind concentrations of PM2.5 (ug/m3).

Pollutants

Particulate matter is the main pollutant for which prescribed fire emissions are monitored, PM2.5 and PM10 (EPA Website; www.epa.gov/pmdesignations). Fine particles (PM2.5) can lodge deeply into the lungs because of their small size, approximately 1/30th the average width of a human hair (EPA Website; www.epa.gov/pmdesignations). They have been associated with premature mortality and other serious health effects. Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes.

Particles less than 10 micrometers in diameter (PM10) pose a health risk because they can be inhaled and accumulate in the respiratory system. "Coarse" particles have diameters between 2.5 and 10 micrometers. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads. Other particles may be formed in the air from the chemical change of gases when gases from burning fuels react with sunlight and water vapor. These particles come from fuel combustion in motor vehicles, at power plants, and in other industrial processes (Environmental Protection Agency Website; www.epa.gov/pmdesignations).

The PM2.5 level will have the most significant impact on the area and people surrounding the project area, and is the focus of the assessment.

Smoke Impact Spreadsheet (SIS)

Description

The Smoke Impact Spreadsheet (SIS) is a planning model that estimates particulate matter (PM) emissions and concentrations downwind of wildland fires (Air Sciences 2003). SIS conservatively predicts (estimates higher than actual) downwind PM concentrations for comparison with appropriate Federal or State air quality standards. Embedded in SIS is an emissions module that calculates broadcast burn and wildfire emissions using the First Order Fire Effects Model (FOFEM 5.0, Reinhardt et al. 1997) and pile burning emissions using the CONSUME 2.1 (Prichard et al. no date) pile wizard. The SIS also incorporates the CALPUFF dispersion model that calculates downwind concentrations.

Primary Use in Analysis

SIS was used to assess the longevity of exposure to PM2.5 concentrations over time due to prescribed burning activities and to determine the potential to exceed EPA and the MDEQ PM2.5 standards set by the CAA and NAAQS.

The process used to determine the burn input spreadsheet was:

- Identify all units being treated with prescribed fire in the alternatives
- Identify the associated National Fire Danger Rating System (NFDRS) fuel models corresponding to fuels within each unit
- Determine associated fuels treatment based upon proposed silvicultural treatments (e.g. pile burn, broadcast burn, slashing treatment)
- Determine aspect and elevation
- Determine treatment size (acres)
- Identify the major overstory tree species in each unit

Inputs for the SIS model were identified and the list was sorted by NFDRS fuel models, treatment and forest cover types, and elevation. Unique combinations were grouped for modeling. After grouping like units together a descriptive scenario code was assigned to the groups corresponding to the SIS modeling inputs. One run was performed for the largest area in each group, which accounted for the largest potential smoke output for each modeling group. The modeling variables, for example time of year, strip spacing, time between pile ignitions, were determined for each grouping based on the fuels specialists' experience with modeling, fire behavior, and prescribed fire.

Core Assumptions

The SIS model predicts 1-hour and 24-hour average PM2.5 concentrations, estimates the effects of daytime and nighttime meteorological conditions, and incorporates a simplified terrain profile.

Known Limitations

SIS is a prescribed fire planning tool, not an operational tool. It assists land managers make informed decisions using the best available science. SIS models the interactions of fire variables and estimates the relative changes in air quality. It does not consider use of actual weather records or three-dimensional terrain data but does include:

- For pile burns – pile shape, dimensions, packing ratio, fuel type for pile burns, and number of piles per burning period.
- For broadcast burns – subunits, starting hour, strip width, strip length, number of strips, strip spacing, ignition rate (ft/min), and ignition time (hours).

- For meteorology – burn date, latitude, 10-meter wind speed (mph), wind direction offset (degrees), maximum temperature, and Pasquill-Gifford stability class.
- For terrain – maximum distance, average elevation of burn, terrain profile.

Because SIS is not an operational tool, it is not used to make the "go/no-go" decisions to ignite prescribed fires.

Anticipated Consequences of Limitations

The SIS model provides worst case scenarios of smoke impacts from the proposed prescribed fire treatments based on the time of year treatments are most likely to occur. Model inputs are constants and there is no avenue to incorporate variability due to landscape, weather, or human factors. The model will not precisely determine the exact amount of smoke release from a burned unit. The possibility of higher smoke production, duration of smoke released, or smoke retention from a burned unit exists because the fire may burn longer than one day; conditions may be warmer, drier, or windier than expected; unpredicted stable air masses may settle over the burn area; or fires may burn past control features or unit boundaries. Weather and air masses are not always accurately predicted for each burn. This tool is not a precise prediction of particulates; however, it is an appropriate tool for analyzing and comparing the potential effects between different alternatives.

3.14.2 Regulatory Framework

3.14.2.1 National Guidance

Clean Air Act, July 1955 (42 U.S.C. 7401 et seq.)

This act provides for the protection and improvement of the nation's air resources and applies to the effects of prescribed fire and can help inform wildfire response.

Congress passed the CAA in 1970, and amended it in 1977 and 1990. The purpose of the CAA is to protect and enhance air quality while ensuring the protection of public health and welfare. The act established NAAQS (Table 3.14- 1), which must be met by most state and federal agencies, including the Forest Service.

Table 3.14- 1: National and Montana State Ambient Air Quality Standards for Particle Pollution

POLLUTANT	TIME PERIOD	FEDERAL (NAAQS)	MONTANA(MAAQS)	STANDARD TYPE
Carbon Monoxide	Hourly Average	35 ppm [a]	23 ppm [a]	Primary
	8-hour average	9 ppm [a]	9 ppm [a]	Primary
Hydrogen Sulfide	Hourly Average	------	0.05 ppm [a]	-----
Lead	90-Day Average	------	1.5 mg/m^3 [b] (rolling)	-----
	Quarterly Average	1.5 mg/m^3 [b] (calendar)		Primary & Sec.
Nitrogen Dioxide	Hourly Average	-----	0.30 ppm [a]	------
	Annual Average	0.053 mg/m^3	0.05 ppm [b]	Primary & Sec.
Ozone	Hourly Average	0.12 ppm [c]	0.10 ppm [a]	Primary & Sec.

POLLUTANT	TIME PERIOD	FEDERAL (NAAQS)	MONTANA(MAAQS)	STANDARD TYPE
PM-10 (existing)	24-Hour Average	150 mg/m^3 [d,j]	150 mg/m^3 [d,j]	Primary & Sec.
	Annual Average	50 mg/m^3 [e]	50 mg/m^3 [e]	Primary & Sec.
PM-10 (revised)	24-Hour Average	150 mg/m^3 [f,j]		Primary & Sec.
	Annual Average	50 mg/m^3 [e]		Primary & Sec.
PM-2.5	24-Hour Average	65 mg/m^3 [g,j]		Primary & Sec.
	Annual Average	15 mg/m^3 [h]		Primary & Sec.
Settleable Particulate	30-Day Average	-----	10 g/m^2 [b]	-----
Sulfur Dioxide	Hourly Average	-----	0.50 ppm [i]	-----
	3-Hour Average	0.50 ppm [k]	-----	-----
	24-Hour Average	0.14 ppm [j,k]	0.10 ppm [a,j]	-----
	Annual Average	0.03 ppm [k]	0.02 ppm [k]	-----
Visibility	Annual Average		3 X 10^{-5}/m [k]	

[1] Not to be exceeded more than once per year on average over 3 years
[2] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
[3] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 14, 2012).
[a] Federal violation when exceeded more than once per calendar year.
[b] Not to be exceeded (ever) for the averaging time period as described in the regulation.
[c] Not to be exceeded more than once per year averaged over 3-years.
[d] Violation occurs when the expected number of days per calendar year with a 24-hour average above this concentration is more than one.
[e] Violation occurs when the expected annual arithmetic mean concentration is above this concentration.
[f] To attain this standard, the 99th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.
[g] To attain this standard, the 98th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.
[h] To attain this standard, the 3-year average of the annual arithmetic mean of the 24-hour concentrations from a single or multiple population oriented monitors must not exceed this concentration.
[I] State violation when exceeded more than eighteen times in any 12 consecutive months.
[j] The standard is based upon a calendar day (midnight to midnight).
[k] Standard never to be exceeded during a calendar year. (See the complete table of National Ambient Air Quality Standards at http://www.epa.gov/air/criteria.html)
Units of measure for the standards are micrograms per cubic meter of air (µg/m3)(http://www.deq.mt.gov/airmonitoring/citguide/appendixb.mcpx)

Should an area not meet or "fail to attain" a particular NAAQS, then that area is designated Nonattainment for that standard. The state must then demonstrate, in the

form of a state implementation plan, how the area will meet the standard in the future. For the South Fork Fish Creek Project, the primary source of air emissions will be from prescribed fire smoke, thus the main NAAQS of concern will be particulate matter. The closest Nonattainment area for particulate matter is Missoula, MT, which is nonattainment for PM_{10}. The Missoula Impact Zone, an area surrounding Missoula in which greater sensitivity is given to potential air quality impacts, begins approximately 57 air miles north/northeast of the project. Potential impacts to the Missoula nonattainment area were

Visibility Protection and Regional Haze

Within Class I areas, visibility is the air quality related value that is most affected, especially by smoke from wildland fire. Particulates that remain suspended in the atmosphere efficiently scatter light and therefore contribute to visibility impairment. Very small particles can travel great distances and contribute to regional haze problems. Cumulative particulate load may be the result of fire use only or urban and industrial sources only, or it may be a combination of the two. The closest Class I areas to the Como Forest Health Project is the Selway-Bitterroot Wilderness, approximately 1.5 air miles west of the project. The Selway-Bitterroot Wilderness was considered in the development of this project.

Conformity

The general conformity provisions of the CAA (Section 176 (c)), prohibit federal agencies from taking action within a non-attainment area that causes or contributes to a new violation of the standards, increases frequency or severity of an existing violation, or delays the timely attainment of a standard as defined in the area plan. The Como Forest Health Project is not subject to the Conformity process since it does not occur within a non-attainment area boundary.

Interim Air Quality Policy for Wildland and Prescribed Fire

EPA promulgated the Interim Air Quality Policy for Wildland and Prescribed Fire (the Policy) in 1998 in order to provide guidance to states and tribes on allowing prescribed fire as a land management tool while meeting air quality goals. The Policy offers incentives to states and tribes that develop a certified smoke management program should smoke from a prescribed fire cause an area to achieve non-attainment status. In accordance with the Policy, the State of Montana has implemented a certified smoke management program. This program is administered through the MT/ID Airshed Group. Member burners of the MT/ID Airshed Group submit burn requests to the Smoke Monitoring Unit, which coordinates and approves prescribed burning activities in a manner designed to meet ambient air quality standards. As a member of the MT/ID Airshed Group, the Forest Service will submit all prescribed burn requests from the South Fork Fish Creek project through the Smoke Monitoring Unit for approval, in accordance with procedures outlined in the MT/ID Airshed Group Operating Guide. Figure 3.14- 1 shows a map of the project area in relation to the nearest Class I and State Impact Zones considered in the development of this project.

All prescribed fire burn plans will address mitigation measures to minimize smoke impacts and comply with the CAA. The Como Forest Health Project is designed to meet the goals, objectives and standards set forth in this law and the following local regulatory framework.

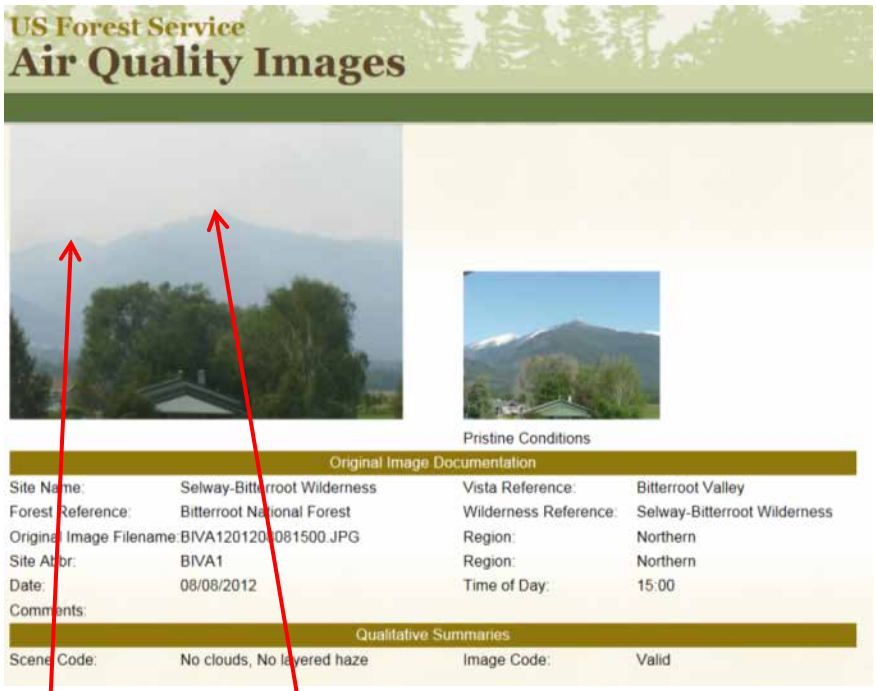

Figure 3.14- 3: Example of Impairment During a Wildfire Looking Towards the Selway Bitterroot Wilderness (SBW) Visibility Image 08/08/2012 1500pm

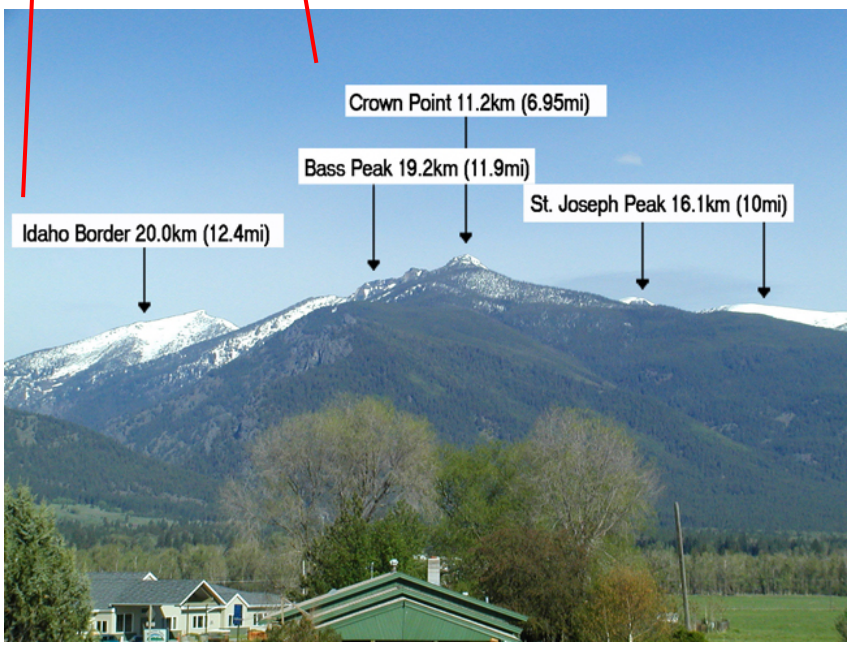

Figure 3.14- 4: What Non-impairment Would be Like Looking Toward the Selway Bitterroot Wilderness

FSM 2580.2 Air Resources - The objectives of air resource management are:

- Protect air quality related values within class I areas, as described in 42 U.S.C. 7475(d)(2)(B) and (C) and section 2580.5.
- Control and minimize air pollutant impact from land management activities.

- Cooperate with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources.

FSM 2580.3 - Policy

- Integrate air resource management objectives into all resource planning and management activities.
- Use cost effective methods of achieving resource management objectives.

3.14.2.2 State Guidance

Department of Environmental Quality and Montana and Idaho Airshed Group

The MDEQ oversees the airshed programs the Montana and Idaho Airshed Group (Airshed Group) implements. All prescribed fire proposed in Montana is reviewed and coordinated through the Airshed Group, which accepts or rejects prescribed fires based on numbers of proposed prescribed fires and local weather forecasts. The annual MDEQ smoke permit requires agencies responsible for the prescribed fire (burners) to implement BACT. BACT are techniques and methods of controlling pollution emissions from an existing or proposed open burning source to the maximum degree. MDEQ determines, on a case-by-case basis, what controls are achievable for that source. MDEQ takes into account impacts on energy use, the environment, the economy, and any other costs, including the cost to the source.

Such techniques and methods may include the following:

- Scheduling burning during periods and seasons of good ventilation
- Forecasting smoke dispersion
- Using MDEQ models to predict and minimize smoke impacts
- Limiting the amount of burning at any one time
- Using ignition and burning techniques which minimize smoke production
- Preparing fuels to minimize dirt and moisture content
- Configuring fuels to create adequate air-to-fuel ratio
- Prioritizing burns as to air quality impact and assigning control techniques accordingly
- Promoting alternative treatments and uses of materials to be burned
- Selecting sites that minimize smoke impact.

States are given the primary responsibility for air quality management. The CAA requires states to develop implementation plans that identify how the state will attain and maintain NAAQS. The Montana CAA promulgated the state implementation plans and created the Montana Air Quality Bureau (now under the Department of Environmental Quality). The CAA also allows States, and some counties, to adopt unique permitting procedures and to apply standards that are more stringent. MDEQ has authorized the Idaho/Montana Airshed Group (made up of State and Federal resource management agencies and private companies with a history of prescribed fire use) to regulate smoke emissions through a burn approval process and monitoring program (www.smokemu.org). The CAA requires that Forest Service actions have “no adverse effect” on air resources by meeting the NAAQS and non-degradation standards for Class I Areas, such as the Selway-Bitterroot Wilderness Area. Managers are further directed to improve substandard existing conditions and reverse negative trends where feasible. Missoula and Butte are

"non-attainment" zones in need of improvement; however, they are outside the impact area of this project.

3.14.2.3 Local Guidance

Bitterroot Forest Plan and Fire Management Action Plan

Direction provided in the Forest Plan (1987) includes Forest-Wide Management Direction (p. II-6)

- Cooperate with State Air Quality Bureaus to prevent significant deterioration of air quality.

Forest-wide Management Standards (p. II-25) include:

- The Forest will cooperate with the Montana and Idaho Air Quality Bureaus in the State Implementation Plans. The Bitterroot National Forest is an active member of the Montana State Airshed Group and adheres to practices and policies of the State of Montana Cooperative Smoke Management Plan.

The 2013 Bitterroot National Forest Fire Management Plan references the Montana/Idaho Airshed Group guidance on making "go/no-go" ignition decisions as direction to burners for prescribed fires on the Bitterroot National Forest. This plan is updated annually.

3.14.3 Affected Environment

3.14.3.1 Air Quality

Air quality in the Como Forest Health Project area is generally excellent, with limited local emission sources and consistent wind dispersion during much of the year. Existing sources of emissions around Darby and the HWY 93 Corridor include residential wood burning, debris burning, road dust, light industry, vehicles, construction equipment, and wildland fire. Emissions are low much of the year, with winter being the period with the greatest emissions from residential wood burning for heat. Wildland fires can produce substantial emissions in the summer and fall for short to moderate durations. Occasional inversions develop in the winter during winter burning periods with stable atmospheres. However, the north-south orientation of the Bitterroot Valley coupled with the typical south-west to north-east weather patterns allows good smoke dispersal most of the time.

The proposed prescribed fires are not subject to conformity provisions of the CAA because the project area is outside the "non-attainment" areas. The conformity provisions prohibit federal agencies from taking any action that contributes to a new violation of the standards, increases an existing violation, or delays attainment of a standard within a non-attainment area. *The Como Forest Health Project is not subject to the conformity provisions since it does not occur within a non-attainment area boundary*. The Como Forest Health Project Area lies entirely within Montana Airshed 4. The airshed is considered an attainment area by the Montana Department of Environmental Quality (DEQ). The Missoula (57 air miles north), Butte (81 air miles east) and Salmon, ID (63 air miles south) non-attainment airsheds are outside the area of influence for prescribed fires in the analysis area.

The Class 1 Airshed, the Selway-Bitterroot Wilderness is located upwind and 1 ¾ quarter air miles west, at the closest, from the project area. The eastern edge of the wilderness could be affected by the proposed project during periods of atmospheric stability or post-

burning. Class I areas must have a Prevention of Significant Deterioration (PSD) permit for new stationary sources. A stationary source is a source of pollution that is well-defined, such as a smokestack. *The Como Forest Health Project is not considered a major stationary source and therefore is not subject to the PSD permitting requirement*.

3.14.4 Environmental Consequences

All alternatives have the potential to produce smoke from wildland fires. Wildland fires will continue to burn and produce smoke, primarily during the summer months. Brown et al. (2001) state that the risk of severe fire after the fires of 2000 is relatively low within 10 years of the fire, moderate within 10 to 30 years of the fire, and high within 30 to 60 years of the fire.

Smoke Exposure and Hospital Admissions

The link between hospital admissions for respiratory and circulatory diseases and smoke exposure is ambiguous (Sharkey 2001). The Centers for Disease Control and Prevention (CDC) investigated whether respiratory and cardiovascular hospital admissions increased in four Montana counties during forest fires of 2000. The study compared differences in hospital admissions between 1999, when wildfires were few, and 2000, when there were many. The counties in the study were Ravalli, Missoula, Lewis and Clark, and Yellowstone. Based on hourly PM10 levels, Ravalli County had the highest exposure to smoke and Yellowstone County had the lowest. Missoula and Lewis and Clark Counties both had moderate exposures. Respiratory disease (chronic obstructive pulmonary disease and pneumonia) and circulatory disease admissions were evaluated.

Particulate levels were higher during the 12-week period in 2000 than in 1999; mean PM10 levels in Ravalli County were 47 ug/m^3, and 34.2 ug/m^3 in Lewis and Clark County. Hospital admission rates for the period (July, August, and September) increased in 2000 for respiratory and circulatory problems, and the admissions rates were higher in the high exposure area. However, analyzing the data on a month by month basis, a temporal exposure-response relationship between particulate levels and rates of hospital admission for respiratory and circulatory problems occurred in July, before the high smoke exposures of August. Missoula County had fewer admissions for circulatory causes in August, while Yellowstone County, the low exposure area, showed an increase. More detailed studies are needed to determine whether there is a link between hospital admissions and smoke exposure.

3.14.4.1 Alternative 1

No smoke would be produced by management ignitions under Alternative 1, the No Action alternative. However, Alternative 1 would not reduce current heavy fuel loadings and fuel continuity on the Como Forest Health Project area. For this reason, it is the least effective of the three alternatives in reducing potential smoke emissions and associated pollutants from future wildland fires.

In the absence of fuel reduction, and in the event of future wildland fire, varying levels of smoke could persist in the Bitterroot Valley for several weeks. Health and visibility could be adversely affected depending on local climatic conditions, level of smoke dispersion, and amount of smoke the fire produces.

3.14.4.2 Effects Common to Alternatives 2, 3 and 4

Alternatives 2 and 3 would effectively reduce potential smoke emissions and associated pollutants in the long term. Alternative 2 will do the most to improve potential smoke impacts because more fuels would be thinned and burned in areas that have high crown fire potential. Also, more areas would have fires periodically prescribed following treatment, which would keep fuel loads down for the long term.

Figure 3.14- 5: Example of Hand Piles Burning at Three Frogs Campground in 2013, Lake Como.

In Alternatives 2, 3 and 4 excess slash produced by treatment activities would be underburned in all units except plantation thinning's, where some areas would be piled and burned. Smoke emissions vary with combustion efficiency and quantity of fuel burned. Machine piles and hand piles (jackpot burns) tend to produce more smoke than other burns because much of the consumption occurs during the inefficient smoldering phase of combustion. Underburns tend to produce less smoke than jackpot burns because less fuel is available to burn.

Table 3.14- 2 shows the modeled maximum PM2.5 concentrations emitted from proposed prescribed fire activity. The 24-hour maximum PM2.5 value would be below the 35 $\mu g/m^3$ threshold within 1.2 miles downwind of the burn. For all runs, the PM2.5 concentrations drop off rapidly after 1.2 miles and never exceed the threshold (Figure 3.14- 8, Figure 3.14- 9). The Forest Service will use BACT when these units are burned to mitigate potential smoke impacts as described in Section 3.4.2. Generally, impacts would be minimal and confined to the project area. However, though prescribed fires are scheduled to occur during favorable weather forecasts, unpredicted weather changes can keep smoke from dispersing as intended.

Figure 3.14- 6: Example of Smoke from Burning Handpiles in the Fall, Trapper-Bunkhouse Unit 11

Figure 3.14- 7: Example of Burning Landing Pile Created by Whole Tree Yarding. Larry Bass TS

The east boundary of the Selway-Bitterroot Wilderness is located within 1.5 air miles of some of the proposed prescribed fires. Wilderness visitors may observe smoke from the project area but it would not be likely to affect them. Burning is planned and implemented for days when winds and atmospheric instability are expected to dissipate smoke away from the wilderness area during the day. At night, down slope and down valley winds will take the smoke directly away from the wilderness area**.** Visitation to the wilderness area is low during spring when most broadcast burns are ignited. Fall burns will be included in all burn options where the airshed is conducive for such burning activities and smoke dispersion is favorable.

Table 3.14- 2: Como Maximum Downwind Concentrations of PM2.5 (ug/m3) for Each Modeling Scenario Used in the Smoke Impacts Spreadsheet (SIS) and Mitigations and Considerations

Run/ Modeling Group Code1	Lake Como Unit#	Modeled Unit Acres	Total Acres Treated			Cover Type	Mitigations* and Considerations	24-hr max PM2.5 (µg/m3) 1.7 mi downwind from unit (with mitigation)
			Alt 2	Alt 3	Alt 4			
cpb4ppUnit 53	53	249	786	993	838	Ponderosa Pine	Limit to 3000 piles/day or 100 acres/day @ 30 piles/acre	19.1
cpb5dfUnitB2	B2	124	681	654	482	Mixed Conifer	None	23.6
cpb6ppUnitC	C	171	171	171	171	Ponderosa Pine	None	32.8
hpb4dfUnit42	42	25	1231	153	0	Mixed Conifer	None	5.04

Run/ Modeling Group Code1	Lake Como Unit#	Modeled Unit Acres	Total Acres Treated			Cover Type	Mitigations* and Considerations	24-hr max PM2.5 (µg/m3) 1.7 mi downwind from unit (with mitigation)
			Alt 2	Alt 3	Alt 4			
hpb5dfUnit45	45	87	681	647	475	Mixed Conifer	None	16.8
cub4ppUnit12	12	199	1179	228	1256	Ponderosa Pine	None	8.32
cub5ppUnit23	23	79	729	858	679	Ponderosa Pine	None	4.5
*hub5dfUnitB	B	51	608	608	581	Mixed Conifer	Break Unit B into 2 units	33.7
hub6mcUnitE	E	371	418	418	418	Lodgepole/ Mixed Conifer	None	27.9
cub6ppUnitC	C	171	171	171	171	Ponderosa Pine	None	8.7

[1]Modeling group code begins with NFDRS Fuel Model designation (C, G, H) followed by pile burn (pb) or underburn (ub) designation, elevation code x1000 (e.g. "5" is 5000 feet), and cover type abbreviation (pp=ponderosa pine, mc=mixed conifer).
NFDRS Fuel Models: Fuel Model C = Open Pine w/ Grass: Fuel Model G = Short Needle Litter, Closed Canopy, Heavy Dead; Fuel Model H = Short Needle Litter, Closed Canopy, Normal Dead. (Deeming et al. 1977).
Typical spring conditions are represented by May 15, 10 mph 20-foot windspeed, maximum temperature of 75 degrees F, 30% moisture content for 1000-hour fuels, and 75% moisture content for duff.
Typical fall conditions are represented by September 15, 10 mph 20-foot windspeed, maximum temperature of 75 degrees F, 20% moisture content for 1000-hour fuels, and 100% moisture content for duff.
*to keep PM2.5 concentrations below 35 ($\mu g/m^3$)

Daily particulate matter standards would be met in Alternatives 2, 3 and 4 by following the Montana/Idaho Smoke Management Plan. That is, NAAQS for PM2.5 and PM10 would be met by implementing BACT, which may include limiting the area burned on any particular day. Smoke from prescribed burning would cause short-term impacts on recreation and transportation in and near the project area. The size and location of a prescribed burn and weather conditions (e.g. temperature, wind, atmospheric stability and mixing, and fuel moisture) determine how much and in what direction smoke travels. Residents in or near the mouths of drainages might experience short-term periods of smoke during early morning inversions.

The effects of each alternative differ in the area treated and in the quantity of smoke that would be produced. Table 3.14- 3 shows the emissions produced, tons of PM2.5 and PM10, for each alternative depending on the type and quantity of fuel treatments. Model scenarios were used to estimate particulate matter emission for the type of burn, summing the total area for that type of treatment, then multiplying the tons/acre by acres represented in that modeling scenario. The initial treatments would take up to six years

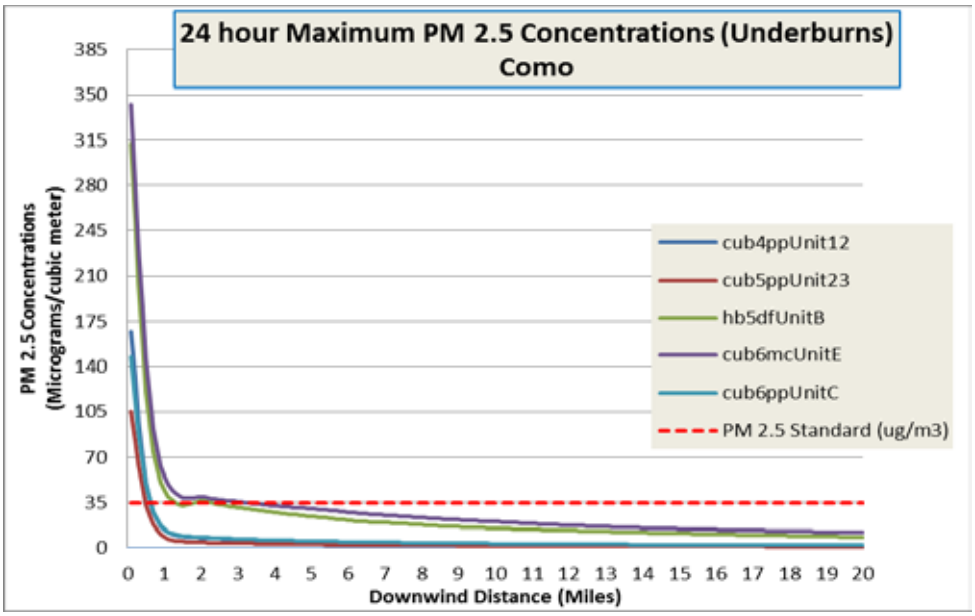

Figure 3.14- 8: 24-Hour Maximum PM2.5 Concentrations Modeled by the Smoke Impact Spreadsheet (SIS) Program. Initial concentrations closest to the burn unit are highest, dropping significantly with increased downwind distance from the unit. These modeling scenarios represent each underburn units in Alternatives 2, 3, 4 corresponding with scenarios in Table 3.14- 2

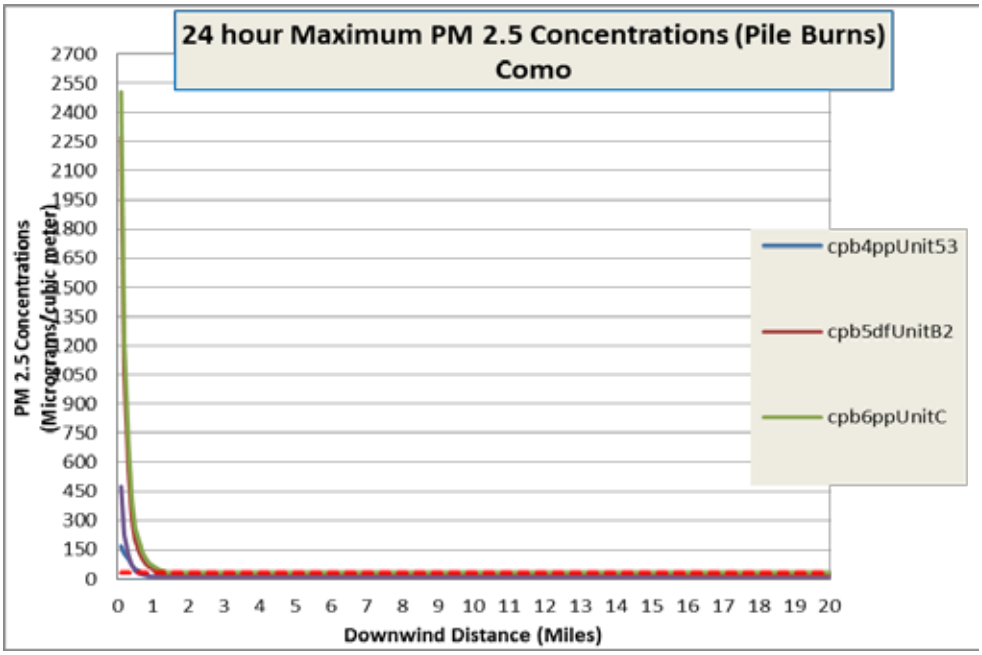

Figure 3.14- 9: 24-Hour Maximum PM2.5 Concentrations Modeled by the Smoke Impact Spreadsheet (SIS) Program. Initial concentrations closest to the burn unit are highest, dropping significantly with increased downwind distance from the unit. These modeling scenarios represent each pile burn units in Alternatives 2, 3 and 4 corresponding with scenarios in Table 3.14- 2

to complete, and the post-treatment burns would occur 6-10 years after the initial treatments, therefore the particulate production shown in Table 3.14- 3 would be dispersed over the next 10 years.

Prescribed Fire Emissions Compared to Wildland Fire Emissions

The heavy fuel loadings and the resulting emissions in the action alternatives are more than the regional averages for upper Clark Fork and central Idaho described by Ottmar et al. (1996) and Brown et al. (2001). Ottmar et al. (1996) calculated the average fuel loadings in the upper Clark Fork near 19 tons per acre, which approximates the average fuel loads in the alternatives. The estimated emissions of the action alternatives are nearly two to six times below wildland fire emissions (Ottmar et al. 1996). Ottmar and Hessburg (1996) indicated wildland fires produce two – four times as much particulates as prescribed fire because *wildland fires generally burn during drought period and consume more total fuel.*

All fires have the potential to temporarily affect downwind visibility.

Concentrations

The SIS with embedded models CONSUME 2.1 and FOFEM5 were used to model smoke concentrations while CALPUFF modeled dispersion rates of smoke after burning. Downwind PM2.5 particulate concentrations are less than 20.4 ug/m^3 in all cases (Table 3.14- 2); low particulate matter concentrations imply visibility and health would be minimally affected.

3.14.4.3 Cumulative Effects

The cumulative effects area is Airshed 4.

Activities/Occurrences with Similar Effects and Past, Present and Reasonable Foreseeable Actions

Smoke from wildland fires would occur with all alternatives, the amount dependent upon climate (Table 3.14- 3). Wildland fires locally, or anywhere in the northwest and Canada, can affect regional haze in the Bitterroot Valley. Frequently, smoke produced from wildland fires on the Payette and Nez Perce-Clearwater National Forests carries into the Bitterroot Valley. This smoke affects visibility, but does not exceed PM10. Natural phenomena like volcanic eruptions and windstorms over deserts also produce particulate matter. The Bitterroot Valley air quality has been affected by dust from as far away as China in 1998 and 2001, and the Mount Saint Helens eruption in 1980.

Metropolitan areas upwind like Seattle and Portland can affect particulate matter. Smoke and dust from agricultural areas like the Palouse Prairie and wheat growing area of eastern Washington and Idaho affect particulate matter in the Bitterroot Valley. Wind on wheat fields of southern Alberta and Saskatchewan, Canada, as well as, eastern Montana affects particulate matter in the Bitterroot Valley.

Private burning of ditches, fields and debris is common. Ravalli County's open burning regulations limit the types of material that may be burned and the period of burning (March 1 through November 30). Burners are also requested to call the Ventilation Hotline 1-800-225-6779 during the fall months to be advised of airshed burning restrictions. Although the Bitterroot National Forest conducts prescribed burning only during periods of good or better smoke dispersion, there may still be some cumulative smoke impacts from burning under the action alternatives and concurrent private and

forestry burning. We will advise the Airshed Group of our prescribe fires to coordinate burning projects with other land ownerships and reduce cumulative smoke-related impacts.

Alternative 1

There would be no cumulative effects on air quality under this alternative except by wildfires occurring within the project area.

Alternatives 2, 3 and 4

Alternative 2 would most effectively reduce potential smoke emissions and associated pollutants from large, uncontrolled wildland fires in the long term because fuels would be treated over more area. Although this alternative would produce the highest smoke emissions over the next 10+ years, those emissions would take place with approval of the Airshed Group, which would reduce impacts to people and communities as compared to uncontrolled wildfires. Alternative 3 and 4 has the lowest smoke emissions of the action alternatives over the next 10+ years because less area would be treated. With less area treated under Alternative 3 and 4, the potential for higher smoke emissions and associated pollutants from large, uncontrolled wildland fires increases.

Burning activity proposed in the action alternatives show summed values of particulate matter as if all burning were taking place at one time—all broadcast burns in one spring period and all pile burns in one fall period. This is unlikely to happen given the constraints of weather and air quality conditions that dictate when burning and the completion of treatments can occur. Because of these constraints, the prescribed burning is likely to occur over the next 15 years, making less cumulative smoke impacts at any one time and location than are modeled.

With the advent of modern fire suppression in the 1940s, impacts to air quality changed from regional haze to local/regional peak emissions events during wildfire. This is because fires burned frequently at low intensities for long periods, and fuel loads were low prior to the fire suppression policy. With fire suppression, fuels loads increased. Presently, fires are either suppressed when small and emit little smoke, or they escape control and the high fuel loads create large, high intensity events that produce a large volume of smoke over a shorter period of time. Either of the action alternatives will begin to reverse this trend. Reducing fuel loads allows fire to burn at lower intensities and without the large events that produce most of the smoke emissions.

The direct smoke effects from prescribed fire will last 1-7 days depending on the length of the smoldering phase and strength of surface and transport winds. Greater amounts of ground and surface fuels are consumed when the smoldering phase occurs for a longer period.

Table 3.14- 3: Particulate Matter, PM2.5 and PM10 Produced (Tons) in Each Alternative over the Next 10+Years

Como Smoke Scenario	Lake Como Unit#	Unit Area (acres)	Alt2	Alt3	Alt 4	Modeled Sum of Emissions Produced	By Scenario	Alt2	Alt3	Alt 4
			Total Area Burned (acres)	Total Area Burned (acres)	Total Area Burned (acres)	(Tons)	(Tons/acre)	PM2.5 (Tons)	PM2.5 (Tons)	PM 2.5 (Tons)
cpb4ppUnit 53	53	249	786	993	838	5.08	0.02	15.72	19.86	16.76
cpb5dfUnitB2	B2	124	681	654	482	4.73	0.04	27.24	26.16	9.28
cpb6ppUnitC	C	171	171	171	171	7.3	0.04	6.84	6.84	6.84
hpb4dfUnit42	42	25	1231	153	0	1.69	0.07	86.17	10.71	0
hpb5dfUnit45	45	87	681	647	475	4.05	0.05	34.05	32.35	23.75
cub4ppUnit12	12	199	1179	1228	1256	25.5	0.13	153.27	159.64	163.28
cub5ppUnit23	23	79	729	858	679	13.61	0.17	123.93	145.86	115.43
hub5dfUnitB	B	451	608	608	581	106.9	0.24	145.92	145.92	139.44
hub6mcUnitE	E	371	418	418	418	150.4	0.41	171.38	171.38	171.38
cub6ppUnitC	C	171	171	171	171	28.2	0.16	27.36	27.36	27.36
Total area burned[1] (acres)			6,655	5,901	5,071	Total PM2.5 Emissions (tons)		791.88	746.08	656.16

[1] Area burned includes maintenance burning.

Mitigation

While the SIS model projects that residents east of the Lake Como Project will not be subject to $PM_{2.5}$ concentrations in violation of NAAQS standards during broadcast or pile burning (100 acres/day or less) operations, there is still the high potential for some short duration smoke impacts. The following operational measures would be conducted to minimize smoke impacts:

Best Available Control Technology (BACT) As per the Forest Service Open burning permit with the State of Montana, Best Available Control Technology will be used to limit impacts from burning operations. This includes submitting and obtaining burn approval from the MT/ID Airshed Group prior to ignition, and burning only during times of at least good ventilation http://www.deq.mt.gov/AirQuality/SmokeManagement.mcpx

Public Notification – Residents within proximity to the burn areas will be notified by mail, email, message or phone, and/or press releases through a variety of media available prior to implementation. Signs may be posted as needed along roads warning of potential visibility impairment from smoke or there may be temporary area closures during ignition operations.

Splitting Burn Blocks Larger burn blocks may be burned over multiple days in order to reduce short term smoke impacts. For pile and landing burning, short term impacts may be lessened by reducing the number of piles burned.

Monitoring/Mop Up All prescribed burns will monitored visually. If any prescribed burn appears to be generating an unacceptable level of smoke, measures may be taken to cease further ignition as is reasonably implementable.

3.14.4.4 Consistency with Bitterroot Forest Plan and Other Regulatory Direction

All prescribed burning would be implemented in full compliance with Montana and Idaho DEQ air programs through cooperation with the Montana/Idaho Airshed Group.

The Bitterroot National Forest Plan includes air quality goals, standards, and management direction that are to "maintain existing air quality." The Bitterroot National Forest cooperates with the Montana air quality regulators through the State Implementation Plan. Furthermore, the Bitterroot National Forest participates in the state of Montana smoke management program to meet National and State air quality standards for PM10 and PM2.5. This project meets or exceeds all criteria to protect air quality.

Air quality terminology used in this analysis is defined as follows.

- "Attainment Areas" are areas that have not exceeded the National Ambient Air Quality Standards (NAAQS) for certain criteria pollutants. NAAQS exist for ozone, carbon monoxide, sulfur dioxides, nitrogen dioxide, lead, and fine (PM 0-2.5) and coarse (PM2.5-10) particulate matter.
- "Non-attainment Areas" are areas that have exceeded the NAAQS for certain criteria pollutants.
- "Class I Area" is the Clean Air Act (CAA) classification that protects the air quality in international parks, national parks greater than 6,000 acres, and national wilderness areas greater than 5,000 acres that existed on August 7, 1977.
- "Criteria Pollutants" are six common pollutants that the Environmental Protection Agency (EPA) uses to determine the air quality designation. The six pollutants are ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide, and lead.
- "Fine particles" are airborne particles less than 2.5 micrometers in diameter (PM2.5)

- "Impact Zone" means any area of Montana or Idaho that the Airshed Group or a local program identifies as smoke sensitive and/or having an existing air quality problem. Impact Zones exist in Montana and Idaho.